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Another Path for Measuring Industrial Parameters

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ABSTRACT

Is there accurate and cost effective solution for measuring industrial parameters like, flow, level, pressure, temperature, weight, volume, density in present era ? Industrial parameters can easily measured by using resistivity and conductivity of materials only. Cost effective way to measure parameters of gas, liquid and Solid materials by measuring change in mili or micro amperes only. Let us understand by below mentioned examples and measuring techniques.

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Resistivity: The electrical resistivity of a material is a number describing how much that material resists the flow ofelectricity. Resistivity is measured in units of ohm·meters (Ω m). If electricity can flow easily through amaterial, that material has low resistivity. If electricity has great difficulty flowing through a material,that material has high resistivity.

The electrical wires in overhead power lines and buildings are made ofcopper or aluminum. This is because copper and aluminum are materials with very low resistivities(about 20 nΩ m), allowing electric power to flow very easily. If these wires were made of high resistivitymaterial like some types of plastic (which can have resistivities about 1 EΩ m (1 x 1018 Ω m)), very littleelectric power would flow.

$$\sigma = \frac{1}{\rho}$$

Electrical resistivity is represented by the Greek letter ρ. Electrical conductivity is represented by the Greek letter σ, and is defined as the inverse of the resistivity. This means a high resistivity is the same asa low conductivity, and a low resistivity is the same as a high conductivity.

Conductivity: Conductivity is measured in micromhos per centimeter (µmhos/cm) or microsiemens per centimeter (µs/cm).

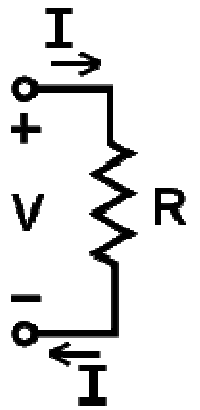
Distilled water has a conductivity in the range of 0.5 to 3 µmhos/cm.

It is the ratio of the current density to the electric field strength. It is equivalent to the electrical conductance measured between opposite faces of a 1-metre cube of the material under test.

The symbol for electrical conductivity is κ (kappa), and also σ (sigma) or γ (gamma).

Electrical conductance is an electrical phenomenon where a material contains movable particles with electric charge (such as electrons), which can carry electricity. When a difference of electrical potential is placed across a conductor, its electrons flow, and an electric current appears.

Ohm's Law:
Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across the two points. Introducing the constant of proportionality, the resistance, one arrives at the usual mathematical equation that describes this relationship:

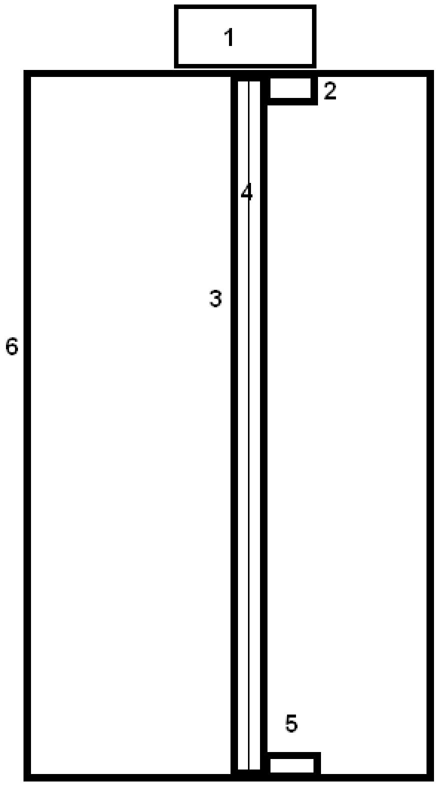


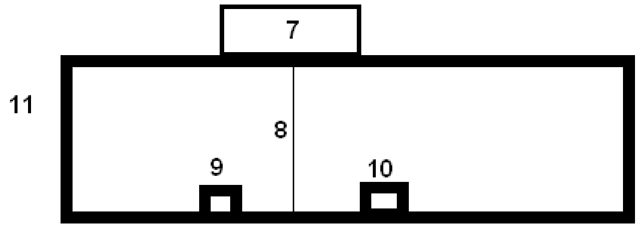
V, I, and R, the parameters of Ohm's law

where *I* is the current through the conductor in units of amperes, *V* is the voltage measured *across* the conductor in units of volts, and *R* is the resistance of the conductor in units of ohms. More specifically, Ohm's law states that the *R* in this relation is constant, independent of the current.

If the resistance is not constant, the previous equation cannot be called *Ohm's law*, but it can still be used as a definition of static/DC resistance.

Examples of level and flow measuring construction diagram are shown in below figure.





Numbers

1 Level measuring transmitter
2 Current detector switch
3 Level indicating insulated pipe
4 Electrical wire conductor
5 Current detector switch
6 Tank
7 Flow measuring transmitter
8 Electrical conductor wire
9 Current detector switch
10 Current detector switch
11 Pipe

Construction equipments: Level and Flow transmitters, Current detector switches, Electrical wire conductors

Level measuring Working Principle: Electrons's flowis maintained in electrical wire conductor in mili amperes while measuring level. Wire conductor is placed in middle of insulated hollow pipe. Top and bottom ends of pipe placed with current detector switches. Change in mili ampere in between current detecting limit switches while material like gas or liquid or solid entering into pipe cause reason of level detection. By doing calibration of level transmitter, accurate reading could be achieved.

Flow measuring Working Principle: Electrons's flowis maintained in electrical wire conductor in mili amperes while measuring flow. Wire conductor is placed in middle of switches. Change in miliampere in between limit switches while material like gas or liquid or solid flowing through the pipe cause reason of flow detection. By doing calibration of flow transmitter, accurate reading could be achieved.

Temperature/Pressure/Volume (weight)/Density measuring working principle:
Flow of electrons is changed when applied under variable temperature, pressure, volume (weight), variable density, media like gases, liquids or solids. Change in mili ampere occurs while measuring. By doing calibration accurate reading can be achieved.

Conclusion:
Flow of electrons increase or decrease(current is directly proportional to material amount in between electric field [current] detector limit switches) when find less resistive path or by introducing conductive material to their bare conductor cause reason of measurement.

By calculating amount or volume of material, amount of current, conductivity and resistivity of media, rest of measurement could be done.

It can become cost effective and accurate solution for industrial measurement of variable parameters.

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